CLAIMS

We claim:

1. A molecular dipolar rotor comprising:
   a base;
   an axle connected to said base and oriented substantially perpendicular to said base;
   a rotor portion having an electric dipole moment.

2. The dipolar rotor of claim 1, wherein the electric dipole moment of the rotor portion is substantially in the plane perpendicular to the axle.

3. The dipolar rotor of claim 2, wherein the electric dipole moment is greater than about 2D.

4. The dipolar rotor of claim 1, further comprising:
   a bearing connecting the axle and the rotor portion.

5. The dipolar rotor of claim 4, wherein said bearing is a metal-to-π-face bond.

6. The dipolar rotor of claim 1, wherein said base is covalently attached to a surface.

7. The dipolar rotor of claim 1, wherein said base is a carbon atom.

8. The dipolar rotor of claim 1, wherein said base is a silicon atom.

9. The diolar rotor of claim 1, wherein said axle is a single bond.

10. The dipolar rotor of claim 1, wherein said axle is a triple bond.

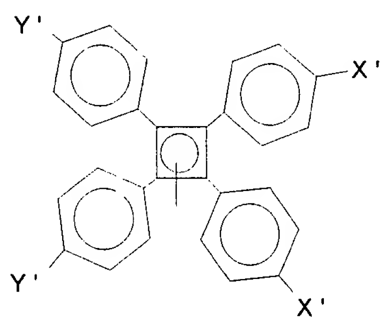
11. The dipolar rotor of claim 1, wherein said axle is a transition metal.

12. The dipolar rotor of claim 1, wherein said rotor is an a substituted aromatic ring.

13. The dipolar rotor of claim 6, wherein said surface is dielectric.

14. The dipolar rotor of claim 1, wherein said rotor portion comprises two or more substituents with opposite charges, wherein said substituents with opposite charges give the molecule a large dipole.

15. The dipolar rotor of claim 14, wherein said rotor portion has the following structure:



where X' is a positively charged substituent and Y' is a negatively charged substituent.

16. A surface-mounted array of dipolar rotors comprising:
dipolar rotors of claim 1 wherein the base is covalently attached to a surface.

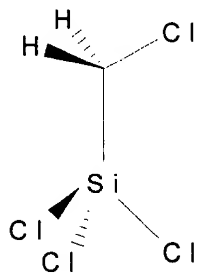
17. The array of claim 16, wherein said surface is dielectric.

18. A device comprising:
a dipolar rotor of claim 1; and
an excitation source that can induce movement of the rotor portion of the dipolar rotor.

19. The device of claim 18, wherein said excitation source is one or more selected from the group consisting of: electrical forces, mechanical forces, magnetic forces or optical forces.

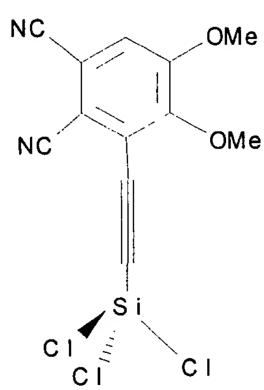
20. The device of claim 19, wherein said dipolar rotor rotates upon excitation by an alternating electric field producing electric current.

21. The molecular dipolar rotor as shown below:



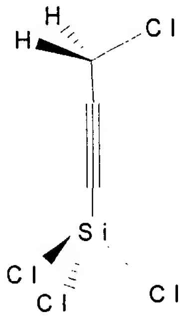
wherein the chlorine atoms attached to silicon act as leaving groups upon reaction with a surface.

22. The molecular dipolar rotor as shown below:



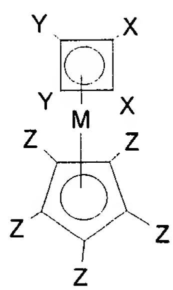
wherein the chlorine atoms attached to silicon act as leaving groups upon reaction with a surface.

23. The molecular dipolar rotor as shown below:



wherein the chlorine atoms attached to silicon act as leaving groups upon reaction with a surface.

24. The molecular dipolar rotor as shown below:



where M is a transition metal, Z is -Hg-S-Z', where Z' is $-(CH_2)_n Si(OR)_3$ where n is an integer from 0 to 15 and R is an alkyl group or optionally substituted alkyl group, Y is a polar or charged group, and X is a polar or charged group, wherein -OR acts as a leaving group upon reaction with a surface.

25. The molecular dipolar rotor as shown in claim 24, where X and Y are p-substituted phenyl rings, where the substitutions on X are positively charged and the substitutions on Y are negatively charged.